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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/909,074	07/19/2001	Joyce S.Oey Hewett	2000.075200/TT4629	9763

23720 7590 05/14/2004

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EXAMINER	
NGUYEN, KHIEM D	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 05/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/909,074	HEWETT ET AL.	
	Examiner	Art Unit	
	Khiem D Nguyen	2823	AW

-- The MAILING DATE of this communication appears on th cover sheet with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2004* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-13 and 15-41* is/are pending in the application.

4a) Of the above claim(s) *16-41* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-13 and 15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

Applicant's arguments filed March 3rd, 2004 have been fully considered but they are not persuasive. The Rejection from paper No. 12 sent December 3rd, 2003 is incorporated in this paper. It is presented here for convenience.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-2 and 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. (U.S. Pub. 2002/0032499) in view of Choi et al. (U.S. Patent 6, 322, 713) and Toyoda et al. (U.S. Patent 6,503,376).

In re claim 1, **Wilson** discloses a method of controlling a conductive layer deposition process comprising (See page3, paragraphs [0023]- [0025] and **FIGS. 1** and 4): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1; paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer deposited on the semiconductor wafer and determining whether the measured thickness of the conductive (copper) layer is within a predetermined tolerance **76** (page 5, paragraph [0042] and **FIG. 4**); and, revising the deposition recipe according to at least one predetermined model if the measured thickness of the conductive (copper) layer is not within the predetermined

tolerance 78 (page 5, paragraph [0042] and **FIG. 4**). **Wilson** does not explicitly disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-cathode spacing of the deposition recipe if the measured thickness of the conductive layer is not within the predetermined tolerance.

Choi discloses that the thickness of a conductive layer may be controlled by the processing variables such as the time, temperature, chemical concentration, and current density (col. 4, lines 20-39) and **Toyoda** discloses wherein the thickness of a conductive layer may be affected by the anode-cathode spacing (col. 1, lines 59-64). In view of recognition that the chemical concentration of an electroplating bath and the anode-cathode spacing affect the thickness of the conductive layer. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Wilson, Choi and Toyoda to achieve or revising the deposition recipe in Wilson by changing the chemical concentration and anode-cathode spacing and furthermore a good thickness distribution of the film can be obtain (col. 3, lines 10-11).

In re claims 2 and 5, **Wilson** discloses wherein depositing a conductive layer above the first semiconductor wafer further comprises deposition a copper layer above a first semiconductor wafer (page 1, paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring the thickness of the conductive layer further comprises measuring the thickness of the copper layer; determining whether the measured thickness of the conductive layer is within a predetermined tolerance further comprises determining whether the measured thickness of the copper layer is within the predetermined tolerance

(page 5, paragraph [0042] and FIG. 4); and, revising the deposition recipe according to at least one predetermined model further comprises revising the deposition recipe if the measured thickness of the copper layer is not within the predetermined tolerance (page 5, paragraph [0042] and FIG. 4);

In re claim 4, **Wilson** discloses using the newest parameter derived in step 80 (FIG. 4) in processing subsequent microelectronic workpieces (paragraph [0042]). Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

3. Claims 6-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. (U.S.P.A.P 2002/0032499) in view of Choi et al. (U.S. Patent 6, 322, 713) and Toyoda et al. (U.S. Patent 6,503,376).

In re claims 6-8, **Wilson** discloses a method of controlling a conductive layer deposition process comprising (page3, paragraph [0025] and **FIGS. 1 and 4**): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1, paragraph [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer at a plurality of predetermined pattern of locations (page 7, paragraph [0061] and Table 1); calculating a value representing the measured thickness measured at the plurality of locations (page 9, paragraph [0088]); determining whether the calculated value is within a predetermined tolerance (page 5, paragraph [0042] and **FIG. 4**); and, revising the deposition recipe based upon at least the calculated value if the calculated value is not within the predetermined 78 (page 5, paragraph [0042] and **FIG. 4**). **Wilson** does not explicitly

disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-cathode spacing of the deposition recipe if the measured thickness of the conductive layer is not within the predetermined tolerance.

Choi discloses that the thickness of a conductive layer may be controlled by the processing variables such as the time, temperature, chemical concentration, and current density (col. 4, lines 20-39) and **Toyoda** discloses the thickness of a conductive layer may be affected by the anode-cathode spacing (col. 1, lines 59-64). In view of recognition that the chemical concentration of an electroplating bath and the anode-cathode spacing affect the thickness of the conductive layer. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Wilson, Choi and Toyoda to achieve or revising the deposition recipe in Wilson by changing the chemical concentration and anode-cathode spacing and furthermore a good thickness distribution of the film can be obtained (col. 3, lines 10-11).

In re claims 9 and 10, **Wilson** discloses calculating a value representing the measured thickness comprises calculating an average (arithmetic mean) of the plurality of thickness measurements (page 9, paragraph [0088]).

In re claims 11 and 12, **Wilson** discloses wherein determining whether the calculated value is within a predetermined tolerance **76** comprises calculating a measure of a degree of dispersion of the plurality of thickness measurements about the calculated value and comparing the measure of the degree of dispersion to a predetermined statistical distribution selected from the group consisting of the standard deviation

(normal distribution) (page 9, paragraphs [0088] and [0091] and page 5, paragraph [0042] and **FIG. 4**).

In re claim 13, **Wilson** discloses wherein revising the deposition recipe further comprises revising the deposition recipe according to at least one predetermined model (page 5, paragraphs [0042]-[0043]).

In re claim 15, **Wilson** discloses using the newest parameter derived in step **80 (FIG. 4)** in processing subsequent microelectronic workpieces (paragraph [0042]). Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

Response to Applicant's Arguments

Applicant's arguments filed March 3rd, 2004 have been fully considered but they are not persuasive.

4. Applicants contend that the reference Choi et al. (U.S. Patent 6, 322, 713) herein known as Choi does not disclose or suggest that the sacrificial layer is a conductive layer.

In response to Applicants' contention that Choi does not disclose or suggest that the sacrificial layer is a conductive layer, examiner respectfully disagree. Applicants are directed to (col. 4, lines 20-39) where Choi discloses as is well known the thickness of the electroplated metal is controlled by the processing variables such as the time, temperature, chemical concentration, and current density. Thus, Choi provides evidence that the thickness of the metal conductive layer may be controlled by revising the chemical concentration of an electroplating bath.

Applicants further contend that the reference Toyoda et al. (U.S. Patent 6,503,376) herein known as Toyoda fails to disclose or suggest revising an anode-cathode spacing of a deposition recipe if a measured thickness of the conductive layer is not within the predetermined tolerance.

In response to Applicants' contention that Toyoda fails to disclose or suggest revising an anode-cathode spacing of a deposition recipe if a measured thickness of the conductive layer is not within the predetermined tolerance, examiner respectfully disagree. Applicants are directed to (col. 1, lines 59-64) where Toyoda discloses changing the distance between the anode and cathode results in a change in the distribution of the thickness of the conductive layer. As previously addressed by the examiner, Wilson et al. (U.S. Pub. 2002/0032499) herein known as Wilson discloses revising the deposition recipe according to at least one predetermined model if the measured thickness of the conductive layer is not within the predetermined tolerance 78 (page 5, paragraph [0042] and FIG. 4). In view of recognition that the chemical concentration of an electroplating bath and the anode-cathode spacing affect the thickness of the conductive layer. Wilson in view of Choi and Toyoda would obviously be combinable to achieve or revising the deposition recipe in Wilson by changing the chemical concentration and anode-cathode spacing. For these reasons, examiner holds the rejection proper.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.
May 7, 2004

W. DAVID COLEMAN
PRIMARY EXAMINER